

Evaluation of Transportation Demand Management Programs at Residential Developments

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Final Report
March 1991



Washington State Department of Transportation

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Final Report

**Research Project GC8719, Task 21
Evaluation of Home-End Transportation Management Program**

EVALUATION OF TRANSPORTATION DEMAND MANAGEMENT PROGRAMS AT RESIDENTIAL DEVELOPMENTS

by

Cy Ulberg
Research Associate Professor
Graduate School of Public Affairs
University of Washington, DC-13
Seattle, Washington 98195

Christine Wolf
Graduate Research Assistant
Graduate School of Public Affairs
University of Washington, DC-13
Seattle, Washington 98195

Washington State Transportation Center (TRAC)
University of Washington, JE-10
The Corbet Building, Suite 204
4507 University Way N.E.
Seattle, Washington 98105

Washington State Department of Transportation
Technical Monitor
L. Roediger
Special Projects Coordinator
Transit Office

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ABSTRACT

Over the last decade, local jurisdictions and transportation agencies have increasingly used transportation demand management (TDM) programs to manage the traffic impacts of new office/industrial and retail developments. More recently, however, King County and the cities of Kirkland, Redmond, and Seattle, Washington, have introduced TDM programs for residential developments or "origin" sites. The objectives of the evaluation discussed in this paper were (1) to document the implementation of home-end TDM strategies and (2) to evaluate their effectiveness in mitigating the number of vehicle trips generated by residential development.

Since few projects had been built and occupied by the time the evaluation concluded, quantitative evaluation was limited, and the success or failure of residential TDM programs could not be determined. However, it was possible to gain an understanding of the nature and reasons for the implementation problems encountered through qualitative means. These included interviews with jurisdictional staff, developers and managers and a focus group among residents. The analysis pointed out problems related to (1) the decision process leading to the imposition of mitigation requirements, (2) the institutional memory of requirements, (3) monitoring, (4) enforcement of compliance, and 5) the adequacy of mitigation measures. The paper concludes with recommendations to mitigate these implementation problems.

INTRODUCTION

Over the last decade, local jurisdictions and transportation agencies have increasingly used transportation demand management (TDM) strategies as a means of managing the traffic impacts of new office/industrial and retail developments. TDM programs are developed for a specific development project to mitigate the transportation impacts associated with it by discouraging single-occupant vehicle (SOV) trips and encouraging travel by high-occupancy vehicle (HOV). They serve the site-specific needs of tenants and are designed to reduce SOV trips and parking demand at a development site. (King County Draft Administrative Guidelines for Application of TSM under SEPA, April 18, 1990)

In the past, these efforts to discourage SOV commutes and encourage HOV modes of transportation have almost exclusively been focused on "destination sites" — office buildings, industrial/office parks, and office/retail developments. Since 1987, however, King County and the cities of Kirkland, Redmond, and Seattle, Washington, (Figure 1) have introduced the concept to residential developments, or "origin" sites, in an attempt to mitigate the transportation impacts of these developments through promotion of HOV use among residents.

Before the onset of this study, no data on residential projects using TDM strategies had been collected, nor had an evaluation been conducted of the TDM programs and the various mitigation measures attempted. An objective assessment of these programs seemed appropriate. Thus, the original objectives of this project were to (1) document the implementation of "home-end" TDM programs and (2) evaluate their effectiveness in managing the transportation impacts of residential developments on freeways and adjacent arterials. These objectives were meant to identify the effect of home-end TDM programs on HOV use by residents and to identify specific effective actions.

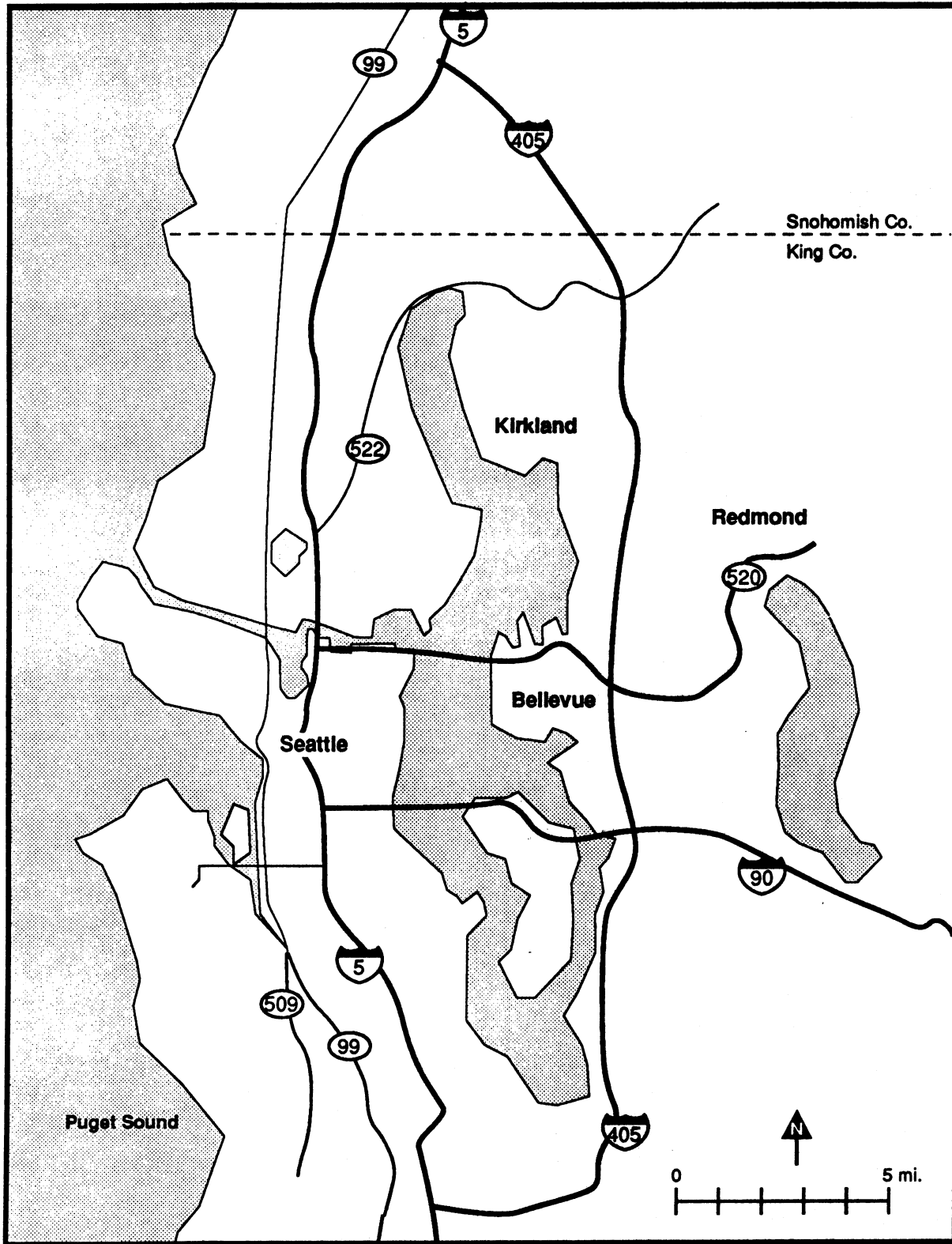


Figure 1. Seattle, Washington Vicinity Map

The researchers intended to combine a number of different methodologies, including surveys of project residents, surveys of ridematch and vanpool applicants, interviews with project developers and managers, and comparisons of vehicle counts between TDM program sites and control sites.

However, in the early stages of the project it became clear that the scope envisioned was not appropriate for the available data. Only a limited number of developments with TDM requirements had been built and occupied by the time the study began, despite the fact that jurisdictions started to require TDM measures at residential developments in 1987. An even smaller number had actually implemented any TDM measures. Surveying residents of projects with TDM programs or conducting formal interviews with developers or managers following a prepared outline also proved very difficult.

Thus, this paper does not determine the success or failure of TDM programs on residential developments, although the researchers gathered as much information relating to the original goals of the study as possible, i.e. the documentation of home-end TDM programs and their evaluation. Rather, the scope of the project was extended to gain an understanding of the nature of the problems encountered in implementing these programs and to develop approaches to minimize these problems. Where possible, new approaches to addressing these problems that have been used in other parts of the country were studied, although none of them has been formally evaluated to date. Conversations with both developers and staff of the involved jurisdictions, as well as a review of available literature, showed that a range of factors not directly related to TDM measures nevertheless affects their effectiveness. These include site design and zoning and land use policies. The paper concludes with recommendations to mitigate TDM implementation problems at residential developments and deal with other problems.

PROJECTS IN KING COUNTY, KIRKLAND, REDMOND, AND SEATTLE WITH TRAFFIC MITIGATION REQUIREMENTS

LOCATIONS AND STATUS OF TDM PROJECTS

The researchers established a list of developments with TDM requirements from files maintained by the Municipality of Metropolitan Seattle (Metro), the region's transit operator. As part of the State Environmental Policy Act (SEPA) process, each jurisdiction informs Metro about major projects with a potentially high impact on transportation. Because, with the exception of the city of Seattle, jurisdictions have generally required developers to negotiate any TDM measures with Metro, its files were relatively comprehensive. An attempt to verify Metro's files was unsuccessful because none of the jurisdictions kept readily accessible files on residential projects with TDM requirements.

In all, 57 residential projects with TDM requirements were identified and analyzed for this paper. Of these, 47 were located in unincorporated King County, three in the city of Kirkland, two in the city of Redmond, and five in the city of Seattle. Thus, almost all projects, as was the focus of the study, were in a suburban environment. According to the research conducted at the outset of this study, none of the other jurisdictions in the region had started to require TDM measures from residential developments. Ten of the projects, all located in unincorporated King County, were single family lot developments; therefore, a comparative analysis of TDM programs implemented for single-family projects versus multi-family projects could not be carried out because of the small sample size of single-family projects. For twelve projects, the information obtained was too limited or outdated, and the developers/managers for these projects could not be contacted. Nine of these projects were within the jurisdiction of King County, and three within the city of Seattle. Two projects, both in unincorporated King County, had been withdrawn and would not be built, and 25 were either still in the

approval process, not started, or partially built. Only 18 had been built and occupied by May 1990 (Figure 2).

TYPES OF HOME-END TDM REQUIREMENTS

Twelve different measures encouraging mode shift have been imposed on residential developments in the Puget Sound region. They can be grouped into four types, including

- the provision of physical structures that encourage mode shift,
- the distribution of transit and rideshare information,
- the collection of information on commute behavior, and
- transit subsidies.

No more than eight measures were required from any single development. Twenty projects had unspecified TDM program requirements, except for sidewalk improvement requirements.

(For a list of requirements on specific projects, see Table 1.)

Structural requirements

Structural requirements relate to the physical aspects of the development. They include a fully connected set of sidewalks on the project and along the street adjacent to the project, bus pads and shelters, and secure bike storage. While sidewalks by themselves do not guarantee a shift in mode choice, convenient and aesthetically pleasing pedestrian access to transit and car- and vanpools can encourage the use of these modes of transportation. They were required in 14 (25 percent) cases, all of them located in King County. For five (9 percent, n=57) of these projects this was the only requirement.

Easy and fast access to transit is a major factor in mode choice; thus the provision of a bus pad and/or shelter on project property can strongly influence the decision to use the bus. In King County four (7 percent) of the developments were required to provide bus pads and/or bus shelters.

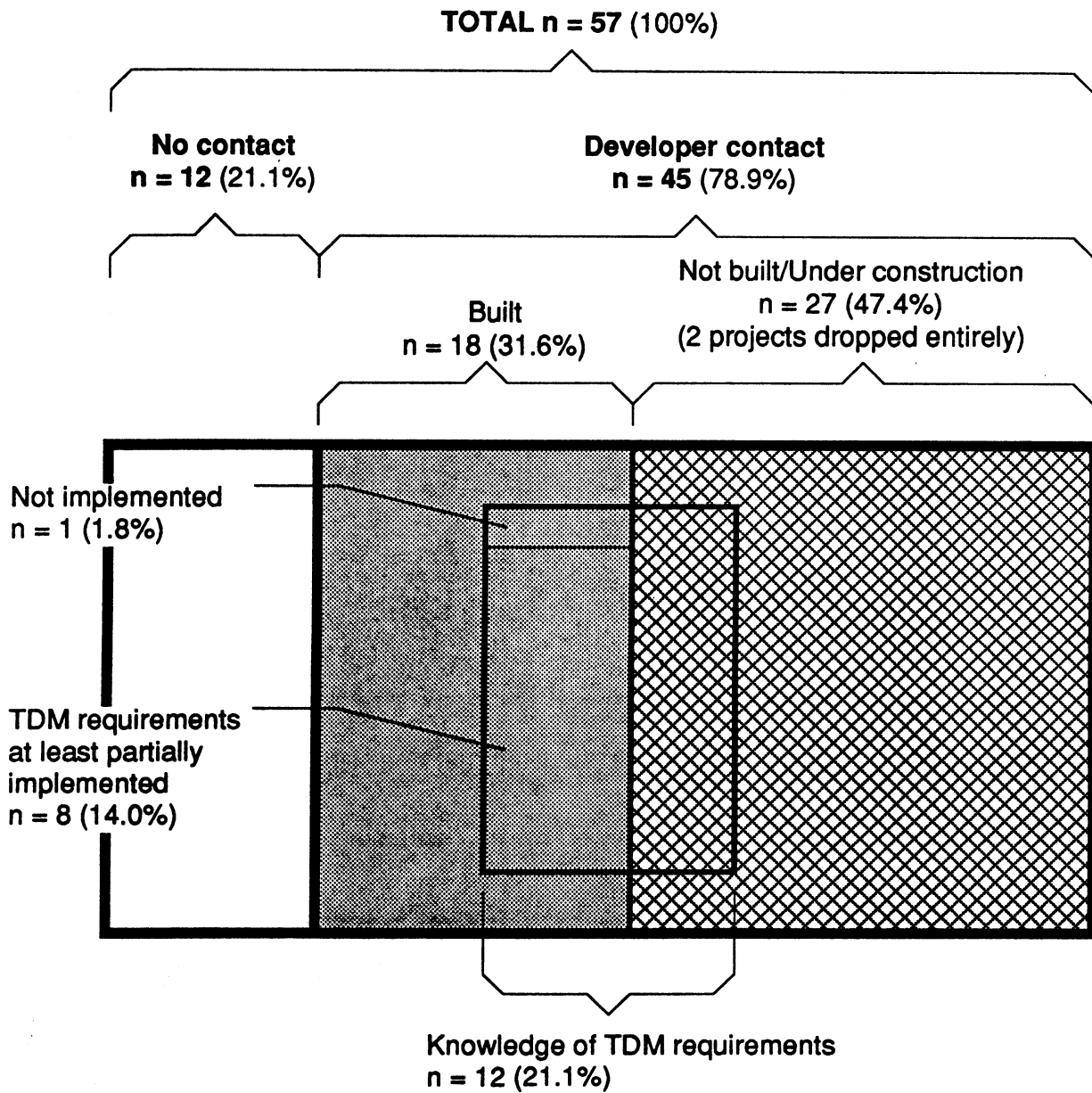


Figure 2. Breakdown of Projects, by Knowledge of TDM Requirements and Compliance

Table 1. Residential Projects – TDM Measures, Knowledge of TDM Requirements and Their Implementation

Name	Project			Amenities				Transit/Rideshare				Data		Subsidies		Developer		
	Units	Type	Built	Wal	Pad	Shel	Bik	Info	CIC	TC	Pro	Sur	Rep	Bus	Shu	Cont	Kno	Impl
The Park at Forbes Ck.	496	mf	X					X	X	X				X	X	X	X	X
Ballinger Commons	485	mf	X				X	X	X	X	X	X	X	X		X	X	X
Redondo Beach Club III	298	mf	X	X				X	X	X	X			X		X		
Riverview Apts	266	mf		X												X		
Emerald Glen II	261	mf			X	X		X		X			X	X		X		
Remington	260	sf	X					X		X		X				X	X	X
Emerald Glen	257	mf	X	X	X	X		X		X				X		X		
Glen Park I	250	mf	X		X			X	X	X	X			X		X	X	
Shadow Brooks	247	sf						X		X		X				X		
Timberline Ridge	242	sf						X						X		X		
Colony at Bear Creek II	238	mf	X				X	X						X		X		
Evergreen Heights	200	mf						X						X		X	X	
Newport Crossing Apts	192	mf		X				X		X	X	X	X	X		X	X	
Kenmore on the Park	180	mf		X												X		
Redondo Reach	167	mf						X		X		X		X		X		
Riverside Apts	150	mf	X											X		X	X	X
Cascade Terrace	144	mf	X											X		X	X	X
Kenmore	140	mf		X												X		
Westview Village	137	mf		X				X		X		X	X	X		X	X	
Silver Shadow Apts	132	mf	X	X		X		X		X				X		X		
White Gate	124	sf		X												X		
Juanita Shores	112	mf					X	X						X		X		
East Empire Gardens	103	mf		X					X									
High Point Park	100	sf					X	X	X	X				X		X		
Salmon Creek Apts	100	mf		X												X		
Westchester Estates	100	sf	X					X		X		X				X		
Terrace View Apts	78	mf					X	X						X		X		
Valley Faire	75	sf		X		X		X		X			X					
Hendrikson Apts.	62	mf							X									
Rainier Meadows Apts	62	mf	X	X												X	X	X
Campus Highlands	53	sf	X					X		X				X		X	X	X
Coal Creek	49	mf					X	X		X				X				
Waterfront Apts	44	mf	X											X		X	X	X
Johnson Court Apts	42	mf						X						X		X		
Queen Anne Apts	17	mf												X				
3515 Wallingfd. Ave N	8	mf												X				

LEGEND

Project: Units = Number of units; Type = type of development (sf = single family, mf = multiple family); Built = Indicates that project has been built

Amenities: Wal = sidewalk, Pad = bus pad, Shel = bus shelter, Bik = bicycle storage

Transit/Rideshare (Distribution of Information): Info = information distribution; CIC = commuter information center; TC = transportation coordinator; Pro = promotion

Data: (Collection of Information on Commuter Behavior) Sur = survey residents; Rep = report

Subsidies: Bus = bus pass; Shu = shuttle

Developer: Cont = Contacted by investigators; Kno = developer knows about requirements; Imp = developer has implemented requirements

While the bicycle is still considered by many to be a means of exercise rather than a means of transportation, an increasing number of Americans commute by bike. The provision of secure bike storage at the residential end makes the use of the bike easier and thus can make this mode of transportation more attractive. Six (11 percent) of the projects were required to provide bike storage facilities. Four were located in King County, and one each in Kirkland and Redmond.

Distribution of transit and rideshare information

The distribution of information about transit and ridesharing options is the most frequent requirement imposed on residential developments. In addition, some developments were obligated to install a commuter information center (CIC), to provide a transportation coordinator (TC), and/or to promote transit and ridesharing options on a regular basis.

The distribution of information on transit and ridesharing options was required in 23 (41 percent) cases, 19 in King County, three in Kirkland, and one in Redmond. This requirement was usually fulfilled with a Metro information package to be received by every new resident of a project, although no procedure was specified.

A commuter information center (CIC) was requested in seven (13 percent) cases, six in King County, and one in Kirkland. CICs were to be established in the clubhouses, the central point of multi-family developments, at a prominent location. They provided current information on transit schedules and ridesharing options and reminded residents of the existence of these services.

To assist residents in finding car- and vanpools, to provide personalized transit information, and to give out bus passes, 17 (30 percent) projects were required to provide a transportation coordinator. Sixteen cases were in King County, one in Kirkland. How much time this person was required to spend on transportation issues was not specified.

Periodic promotion of transit and ridesharing options was required in four (7 percent) cases in King County. No time frame or procedure was specified.

Collection of information on the commute behavior of residents

To improve existing transit and rideshare services, updated information on the commute behavior and needs of residents is essential. Seven (13 percent) projects were asked to survey their residents or tenants upon request, five (9 percent) to write a report on a regular basis. All projects were located in King County.

Transit subsidy or provision

To facilitate transit use, some developments were required to provide free monthly bus passes to new or first-time residents. One project was required to provide peak-hour shuttle services to the closest park and ride lot.

The provision of free one-month bus passes, or in one case in King County a 50 percent subsidy, was required in 24 (43 percent) cases. All four developments in the city of Seattle were required to give free bus passes to first-time or new residents over a period of three months. Fifteen developments in King County, as well as all projects in Kirkland (three) and Redmond (two), were required to provide free one-month passes.

One project was to provide peak-hour shuttle services to the nearest park and ride lot. Originally, two projects, both large multi-family projects, had this requirement, but it was implemented only at the one in Kirkland. Unincorporated King County did not follow through on the enforcement of implementation for the second one.

KNOWLEDGE OF AND COMPLIANCE WITH TDM REQUIREMENTS

KNOWLEDGE OF THE REQUIREMENTS

The developers or managers of 12 (27 percent) of the 45 projects for which contact could be made acknowledged awareness of at least one TDM requirement. Out of 21 projects where more than one requirement was imposed, developers of eight of them were aware of the requirements. However, two companies owned six of the projects. In all, only six companies in the area paid serious attention to the requirements. The two companies with more than one project with TDM requirements were among the biggest developers in the region and had a political and economic stake in successful relations with the jurisdiction. They were willing to comply with requirements they considered minor to preclude negative public opinion and higher mitigation costs. All four developers contacted who had both a sidewalk requirement and a generic "TDM program" requirement knew only about the sidewalk. Three projects reviewed had the single obligation to provide a free bus pass to first-time residents. Managers or developers of these projects were aware of the requirement. It is possible that in some cases developers claimed no knowledge of TDM requirements to cover their unwillingness to comply with them. In cases where the researchers suspected this, they could not establish whether the requirements were just considered minor and thus ignored until the developer was questioned about their implementation, or whether the TDM concept itself was not considered worthwhile. None of the 20 developers of projects with unspecified TDM program requirements was aware of any requirements.

COMPLIANCE WITH THE REQUIREMENTS

While the existence of TDM requirements on projects could be determined with Metro lists, no sources other than the developers themselves were available to establish

compliance for all but two of the projects. Thus, compliance had to be determined by interviews with developers.

Of the 12 projects for which developers acknowledged the requirement(s), only nine (75 percent) had been built and occupied by May 1990. Of these nine, the requirements of eight (89 percent) had been implemented at least in part. As stated above, four of them had only a single requirement, three to provide monthly bus passes, one to provide sidewalks. Four other developments, each with a different set of requirements, belonged to the two previously mentioned major development companies. At the time this study was conducted, two of them were just starting to implement the measures because the developments had been occupied only recently. One developer acknowledged the requirements in an interview and stated that they were minor both in terms of costs and personnel, even though five different measures were required. However, he had not implemented them.

PERCEPTIONS OF REQUIREMENTS

PERCEPTIONS OF DEVELOPERS AND MANAGERS

A list of questions for developers and managers (see Appendix A for interview guides) was prepared and used to guide informal interviews with developers and managers. No attempt was made to obtain statistically reliable data from this population. Thus, the information presented below is qualitative rather than quantitative and cannot be considered representative of all residential projects. It ranges from general data about the projects and their target clientele to more specific information on TDM program requirements.

New multi-family developments in the region for which this information had been gained were geared toward the middle or upper-middle class income range. None of the projects contained low income housing. Background checks on prospective tenants of a sample of these developments, conducted at most new projects, showed average incomes between \$36,000 and \$43,000 per apartment. The turnover rates ranged between 5 and 10 percent per month, or around 75 percent per year, and were considered normal by the management. With the exception of the few projects within the city of Seattle where the parking ratios were around 1.2 per apartment, the parking ratios on the suburban projects ranged from 1.6 to 2 spaces per apartment.

In general, the representatives of the development community were not very interested in the TDM requirements on their projects. They did not consider them important and, for the most part, seemed either not to be aware of them or to ignore them. In many cases, the developers had no concept of the requirements and their rationale and/or were not particularly cooperative. The only exceptions were two of the major companies in the area, and developments in the city of Seattle, where all contacted developers complied with their requirements. Transportation issues such as access to transit or proximity of park and ride lots were not decision criteria in siting projects.

Those who were aware of the requirements for their projects tended to be skeptical about the actual success of these programs.

None of the developers considered the requirements to provide information, a commuter information center, a bus pass, or a transportation coordinator a problem. While no developer had kept track of the actual costs for these requirements, both financial and personnel costs were considered minor or negligible in comparison to the overall costs of the project. This was true both for projects where these TDM measures were implemented, with estimated costs in most cases below \$1000, as well as for projects whose developers were asked to estimate the potential costs of the above requirements for their projects. (A one-zone pass cost \$26, and the distribution of information and passes was easily incorporated into the work of the project manager.) The only exception was the shuttle at the Park at Forbes Creek, where the ridership did not justify the expense. According to the developer, operating costs were about \$3,000 per month, and the resale value of the project would have decreased by \$400,000 if this expense had continued.

However, much more concern was expressed about the high costs of physical requirements such as sidewalks and bus pads, which can run up to several tens of thousands of dollars. In one case, the requirement for a sidewalk along the project was at first overlooked by the developer but later enforced by the county. The company refrained from going to court only because of plans for a second project in the neighborhood of the first one. None of the developers who acknowledged the existence of requirements had any problems understanding or implementing them.

With one exception, all representatives of developers who actually contacted Metro to negotiate and/or implement its requirements were pleased with the support Metro staff had given them. Metro response was considered timely and adequate.

PERCEPTIONS OF RESIDENTS AND TENANTS

The material presented below was obtained through previously unpublished surveys conducted by Metro of residents of Ballinger Commons (Metro, 1989a) and The Park at Forbes Creek (Metro, 1989b), two projects with TDM requirements, a focus group meeting, and comments from managers and developers. The limited number of cases did not warrant distinguishing the projects by external factors such as the level of transit service available or density around the projects.

Interviews with managers of multi-family developments revealed that the interest of residents in transit and car- and vanpool options was small. If residents asked for transit information at all, which they rarely did, questions about directions and distance to the closest park and ride lot prevailed. To the knowledge of the developers and managers, there were no tenants who did not own a car and were thus dependent on transit. As the manager of one of the projects put it: "People who move here expect to use their cars."

The experience with the shuttle service at The Park at Forbes Creek confirmed this attitude. Here, the developer was required to provide free peak-hour shuttle services to the closest park and ride lot. While The Park had close to 500 units and an occupancy rate of 95 percent, only five residents rode the shuttle on a regular basis. The shuttle service was discontinued after nine months.

According to the manager, only 5 percent of Park residents took advantage of the substitute offer, a free one-month, two-zone bus pass. For five other projects with a bus pass requirement, a similar response rate was reported. While no figures on the actual number of requested bus passes could be obtained, the managers of these projects estimated that between 5 and 10 percent of the residents had asked for the passes. In most cases, the tenant was informed about the offer personally or through an information package upon moving in. The only exception to this was Remington, a single-family project, where about 40 percent of the residents had requested a bus pass (Hendriksen,

1990). In that case, however, the offer was made at the project's well attended first Home Owners Association meeting, after the transportation management requirements had been introduced. Residents just checked their name on a list. At Ballinger Commons, the one project where this information was available, survey results indicated that the bus passes were used an average of nineteen times during that month.

One other requirement on large multi-family projects was the provision of a commuter information center (CIC). According to the Ballinger Commons survey, despite the fact that 65 percent of the respondents knew about the existence of the CIC, only 11 percent had ever looked at it (n=190). At The Park, 55 percent (n=76) of the respondents had considered it very likely or somewhat likely that they would commute by bus, carpool, or vanpool if a CIC were available. However, despite the fact that The Park provided a CIC and had gone to great effort to inform residents about the shuttle and other transit and ridesharing options, only 23 percent of the respondents actually had used one of these modes of transportation. The manager had even used the closed-circuit TV system of the project for promotion without, according to him, any success.

Participants of the focus group meeting at the single-family development stated that they would be more likely to take notice of transit or rideshare options if the information were provided in a regular newsletter, e.g., the monthly publication from the Home Owners Association. They suggested that the transportation coordinator on the project be responsible for listing project residents who were interested in carpooling or vanpooling in the newsletter, include information from the ridesharing agency in the area, as well as transit information and updates.

Residents were asked about the likelihood that they would change their mode of transportation if someone at the residence would help them plan their commute. At The Park, where the shuttle service was provided, 38 percent of the respondents answered that they were very likely or somewhat likely to change their commute behavior. At Ballinger Commons, 24 percent considered it very or somewhat likely. Interestingly, both projects

had a TC requirement, and at both sites a representative of the management served in that position at the time the survey was conducted.

Several projects were required to provide secure bicycle storage facilities. When asked whether they would change their commute if bicycle facilities (bike paths, storage for bikes, free loaner bikes to ride to a nearby park and ride lot) were provided, 38 percent of the respondents at The Park considered it very likely or somewhat likely. At Ballinger Commons, 7 percent considered it very likely or somewhat likely.

For reasons stated above, very little can be said about the effectiveness of different TDM measures on residential projects. It seems clear, however, that most residents are not interested in using HOV modes of transportation at projects without low-income housing. It is also not apparent to what extent people's stated willingness to change behavior will match their actual behavior over time. However, the survey results from The Park indicate that actual behavior changes may be much smaller than the stated willingness to make those changes.

IMPLEMENTATION PROBLEMS WITH EXISTING RESIDENTIAL TDM PROGRAMS

Since the original intent of the research could not be carried out because of the small number of developments with TDM programs, the researchers tried to identify reasons for this failure. In the process of research for this project, a number of problem areas were uncovered related to

- the decision process that leads to TDM program requirements for residential projects,
- institutional memory about the requirements,
- monitoring,
- enforcement of compliance, and
- adequacy of the measures.

The following is a description of these problems.

DECISION PROCESS LEADING TO THE IMPOSITION OF REQUIREMENTS

All projects listed in this study were assigned requirements under a case-by-case negotiation process as part of the State Environmental Policy Act (SEPA) review. Interviews with staff showed that as of May 1990 none of the jurisdictions had established administrative guidelines or an ordinance imposing TDM requirements on residential developments, although efforts were under way to establish ordinances in all four jurisdictions. No performance goals had been established by any of the jurisdictions, neither for the overall effect of TDM strategies on residential projects nor for specific projects or classes of projects. King County, Kirkland, and Redmond usually required the developers of projects to contact Metro to negotiate the set of TDM measures appropriate for that project and/or to fulfill the requirements. However, procedures varied among jurisdictions.

Kirkland used a "rule of thumb" to decide on requirements for particular projects and had not established a coherent set of criteria or a consistent process. In Redmond, a project generally had TDM requirements if it contained more than 100 units. If it was close to a bus line, it was required to provide a bus pad and shelter as well as pedestrian access to that shelter. Further requirements were the distribution of information on transit and ridesharing options and a free one-month bus pass over a varying period of time. However, the process was not well established and staff were not operating on a decisive set of criteria.

Unincorporated King County had tried to establish a process for assigning requirements to residential developments. In general, when a project was large enough to be required to conduct a traffic impact study under SEPA, a special review process to include transportation demand management was triggered. The county then tried to ensure that Metro received a copy of the study. In turn, Metro was supposed to put together a set of requirements to recommend to the county. Because of a lack of an established procedure, this process collapsed. From then on, Metro was usually notified as part of the regular SEPA procedure for the project. Metro would work out a set of requirements in negotiation with the developer and send it to King County's Building and Land Development division to be included in further permit review and approval.

In the city of Seattle, residential projects with 20 or more parking spaces had TDM requirements. The Department of Engineering looked at the permit application for each project and could require further information. If deemed necessary, it might ask the Department of Construction and Land Use to request a traffic impact study. After review of all available information, the Department of Engineering would, in close cooperation with Metro, propose requirements such as bus passes or CICs, but the Department of Construction and Land Use (DCLU) was responsible for imposing the requirements. DCLU was not required to follow the Department of Engineering's suggestions. This

process was followed for all types of projects within the jurisdiction of the city of Seattle under SEPA, including non-residential land uses.

These processes allowed for a great amount of flexibility and thus enabled the planning staffs in each jurisdiction to set requirements for a project according to the unique situation of a site. This flexibility can be advantageous when new TDM measures are tested; however, it can also create a set of problems, as described below.

During the initial review, insufficiently trained staff may be unable to recognize the significance of a project because of inexperience with TDM programs on that type of project. They may use their discretion and decide that the project does not need mitigation, while it actually has unrecognized or underestimated impacts that justify TDM requirements. While such requirements can still be imposed at a later stage, that is not likely to happen.

If there is no established process, implementation of TDM program measures is open to irregularities and — unintended — equity problems. As can be seen in Figure 3, there was no relation between the size of the project and the type or number of requirements imposed on that project, despite the fact that Metro, a single agency, established the requirements for the majority of developments in suburban areas. There were no clear thresholds for any given mitigation measure. (Figure 3)

A further problem lay in the need to use SEPA procedures. First of all, only projects considered for SEPA review were considered for TDM requirements. Second, if a project had a large enough impact to justify transportation mitigation measures, they could be implemented in two ways: (1) if the project was considered insignificant under SEPA for all other issues, it had to receive a determination of insignificance that included the mitigation for transportation impacts; or (2) if a project was expected to have a significant impact under SEPA, an Environmental Impact Study would be required and transportation mitigation measures would result from that process. When this paper was written, no process had been established to ensure that mitigation would occur.

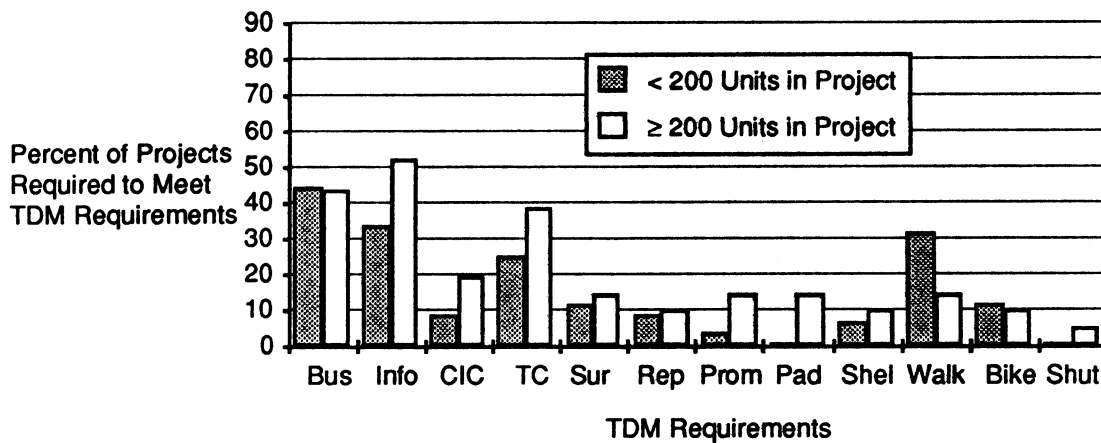


Figure 3. Relationship between TDM Requirements and Percent of Projects Required to Meet Those TDM Requirements

An additional problem was posed by the fact that the use of SEPA tended to curtail regional mitigation. While one project by itself may not have a significant traffic impact, it can create problems if it is combined with other projects nearby. SW Campus Drive in Federal Way is a case in point. Campus Drive was a major development area in which several of the projects analyzed in this paper were located. In at least three cases, TDM measures were required for developments with more than one building phase, but only one of the phases had TDM requirements. One single-family development had five divisions totaling over 300 houses, but only one of its divisions, with about 60 houses, had TDM requirements. On at least one project, of about the same size as its neighbors, no requirements were imposed. SEPA theoretically requires consideration of cumulative impacts, but administratively, it is very difficult to impose mitigation measures based on cumulative impacts. This difficulty was apparent in cases in which no procedure had been established, such as in the residential projects analyzed here.

In the Puget Sound region, the decision process using the case-by-case approach has proved to be too flexible. To ensure predictability and continuity, an ordinance must be developed that structures the requirements for residential developments and/or sets clear performance goals for the TDM program on the residential project. However, the development of an ordinance requires a certain amount of commitment by the jurisdictions to TDM requirements on residential projects. They need to decide what they want to achieve with the policy, relate it to their overall transportation goals, and determine how much staff and money they are willing to commit to the effort.

INSTITUTIONAL MEMORY OF THE REQUIREMENTS

According to officials, none of the jurisdictions that had residential developments with TDM requirements had a compliance tracking system when this paper was written. Thus, information on requirements for developments could and did get lost. Even for the city of Seattle, which had a process to determine the significance of applications, information proved to be incomplete. A representative of the county conceded that under the present system, information on transportation mitigation requirements could get lost when the application went through the subsequent stages. Thus, Metro could have projects on file that were supposed to implement TDM measures, but the county might not have received notice of any requirements on the same project.

As described above, only a small percentage of the developers contacted claimed awareness of the requirements on their projects. While some lack of knowledge can be explained by the lack of a jurisdictional tracking system and active enforcement, there were other reasons for this phenomenon. At the developer's office, the person who guided a project through the permit application process was not necessarily the person who would be responsible for it when the time came to implement the requirements. This could be true even within the same company. Interviews with developers showed, in at least three cases, that the agent responsible for a project changed during the course of this

investigation. Even though the first respondent had been aware of the requirements imposed on the project or was in the process of negotiating them, the next person did not know about them. In another case, the respondent said that he had just taken over the project, had found reference to the mitigation requirements only by chance, and was starting to negotiate them.

Further complicating the transfer of information is the fact that, commonly, development companies hand a project over to a management company once it is occupied. While the agent in the developer's office may be aware of the requirements, on-site management may not be informed. In at least one case the researchers observed that information on requirements was lost in the transferral process. One developer mentioned that a 1986 change in tax law complicated the process of information transmission. The law made it more profitable for developers to sell their projects shortly after they were finished and occupied and thus increased the percentage of projects that were sold shortly after completion.

Institutional memory is an important factor in ensuring compliance with TDM requirements. The analysis of existing projects and requirements showed that both the staff at the jurisdictions and the developers, managers, and owners of residential projects often did not know about the requirements of the project, or in the case of the developer or manager, claimed not to know about them.

To ensure that the information does not get lost both at the jurisdiction's and the developer's offices, the TDM ordinance should have clearly defined objectives and requirements. It is important to tie the requirements explicitly to the land, independent of ownership or control of the project.

MONITORING COMPLIANCE

A monitoring mechanism is needed to ensure compliance with the mitigation measures and to determine whether the developer has made a "good faith" effort to

implement the mitigation measures within a reasonable time frame and at an acceptable level of quality. Furthermore, monitoring is particularly important for a new set of rules and requirements (such as transportation mitigation measures for residential developments) to enable the jurisdictions, Metro, and developers to examine the usefulness of the measures or sets of measures and to modify them accordingly.

When this paper was written, monitoring for compliance with mitigation measures in the Puget Sound region was very limited. This lack of attention could explain in part why so few developers responded that they knew about the measures. None of the jurisdictions had established a process of monitoring compliance, nor was any of them monitoring projects with TDM requirements on an informal basis. However, there were a few exceptions.

In the case of The Park at Forbes Creek, the developer had completed the negotiation process with Metro and had complied with all requirements, including the shuttle. The project had been monitored by Metro. Without Metro's interest in the shuttle and its ridership problems, and without the developer's desire to make the project work, Metro would not normally have monitored it so closely. According to the developer, one staff member of the city of Kirkland, where the project was located, made "a few informal phone calls." None of the other four projects with requirements belonging to that company had been closely monitored.

Apart from that, monitoring occurred only when mitigation measures required physical structures such as sidewalks or bus pads and shelters, or, as in the city of Seattle, CICs. In one case in the city of Seattle, compliance with a CIC requirement was monitored when the Certificate of Occupancy was issued, but there was no follow up.

None of the jurisdictions in the Puget Sound area effectively monitored the projects, except when physical structure such as sidewalks were required. Thus, neither the effectiveness of the existing mitigation measures nor compliance with the TDM requirements could be established.

ENFORCEMENT OF COMPLIANCE

Enforcement of mitigation measures should not be necessary if the developer makes an earnest effort to comply with them and make them work. However, jurisdictions need to establish a legal basis for enforcement so that violations can be pursued.

Since none of the jurisdictions had effectively monitored compliance with TDM requirements on residential developments or established any performance goals, it is not surprising that none of the jurisdictions in the Puget Sound area had established penalties for noncompliance when this analysis was conducted. Again, the only exceptions seemed physical structures such as sidewalks and the shuttle at The Park at Forbes Creek. The shuttle at The Park was the only requirement for which performance goals been established on any of the projects.

However, to set performance goals for the traffic mitigation measures on a residential development, the jurisdiction must first decide what it wants to achieve with its residential TDM programs; that is, it must establish its role in achieving its overall transportation goals. It then must determine how close to achieving these goals it can come, given its financial, personnel, and political situation, and adjust them accordingly. Only if a realistic and feasible balance between the goals of the mitigation measures and the administrative capacity is achieved can transportation mitigation requirements be monitored and enforced effectively and the credibility of the program be ensured.

ADEQUACY OF TDM REQUIREMENTS

Even if the developer makes a good faith effort to implement the requirements imposed on the project, they will not necessarily result in a significant or recognizable change in commuting habits. The experience with the free shuttle service at The Park at Forbes Creek, where the developer made every effort to make it work, is a case in point. Obviously, it was not the appropriate measure, given the location of The Park and the demographic composition of its residents. Other examples include projects located on

Campus Drive South West in Federal Way. Campus Drive South West is a new development area with about 3,000 new apartments and houses. When the research for this paper was conducted, it did not have walking access to a bus line, only driving access to a park and ride lot three miles away. However, three of the projects with TDM requirements had a bus pass requirement.

Other factors, such as the proximity and convenience of transit service; the destination and length of commute trips; transportation and parking management at the work site; size, design, and lay-out factors at both the residential site and work site; as well as land use and zoning decisions, are important determinants that can potentially overwhelm all incentives resulting from the mitigation measures. These factors are addressed below.

DIFFERENT APPROACHES FOR TDM PROGRAMS AND THEIR IMPLICATIONS

In recent years, a small number of communities in other parts of the country has established traffic mitigation ordinances that include measures for residential developments. While none of them has been formally evaluated yet, their consideration may assist in solving the problems identified for the home-end TDM programs in the Puget Sound region.

DECISION PROCESS LEADING TO THE IMPOSITION OF THE REQUIREMENTS

The problems arising from a case-by-case approach, as described above, indicate that, despite its flexibility, it is not the appropriate method. The decision between predictability and equity, combined with better administrative feasibility on the one hand and effective requirements tailored to the individual project on the other, should be made clear and carefully considered on a political level. Below, two very different existing approaches are described.

The first approach is the development of an ordinance with minimum size thresholds for increasing sets of requirements for residential projects.

North Brunswick, New Jersey's, traffic management ordinance is a good example of such an ordinance. For developments of 20 or more units, the developer must conduct a commuter survey to determine, among other factors, work place location and work schedule characteristics. For developments with 50 to 200 units, a 15-car vanpool park and pool lot is required. A 200 to 350 unit project must provide 30 park and pool spaces. A development with 350 or more units must construct park and ride facilities at the ratio of one parking space per ten units. (Kish, 1990; KPMG Peat Marwick, 1989)

Montgomery County, Maryland, on the other hand, allows the developer to choose among a set of options. The developer can decide either to finance the expansion of roads or to reduce commute trips on an already existing project to mitigate the impact

of the new development. In the latter case, the county authorizes the developer to devise the program, but the plan has to be approved by the county. (Hekimian, 1990; KPMG Peat Marwick, 1989) This approach allows development of a set of TDM measures tailored to the individual project and the transportation problems and options of its surroundings.

While this investigation was conducted, unincorporated King County and Seattle were in the process of drafting ordinances that included transportation mitigation measures on residential developments. Unincorporated King County, Kirkland, and Redmond were involved in drafting a TDM ordinance for the Eastside Transportation Program (ETP), which is trying to coordinate transportation planning for a larger area in eastern Puget Sound. The ETP includes parts of King County on the eastern shore of Lake Washington, as well as Kirkland, Redmond, Bellevue, Bothell, and Issaquah (see Figure 1 for map). In its residential section, the proposed ordinance required every developer of one or more units to disseminate public transportation information to new tenants or home buyers, in addition to free ride coupons. Furthermore, it required a financial contribution to park and ride lots or HOV facilities. Developments with 10 or more units were required to present a site plan facilitating public transportation needs and access to transit and ridesharing facilities. Each residential development over 50 units was required to conduct a biannual survey of its residents and to comply with all other requirements. By increasing the responsibilities of the developer with increasing project scale, it was a fair and equitable approach, since it applied to virtually every developer and not only to those above a certain size. (ETP, 1990)

Thus, all jurisdictions involved had recognized the need for clearly defined, consistent and predictable TDM requirements and were working towards that end when this paper was written.

INSTITUTIONAL MEMORY OF THE REQUIREMENTS

As discussed above, one of the major problems with the existing approach is related to the lack of the jurisdictions' and developers' knowledge about the TDM requirements. If no process ensures that both know about the requirements imposed on the project, it is very easy for the developer (or later, the manager) to lose track of or ignore the requirements. Since measures are usually implemented only after the project has been occupied, when the original developer may already have sold the project or handed it over to a management company, they should be tied to the land. In addition, an effective monitoring process should ensure tracking.

One way to make sure that both the administrative staff of the jurisdiction and the developer are aware of the requirements is to establish an ordinance with a clear set of requirements dependent on the size of the development. Once in place, the requirements will become common knowledge, and developers with more than one project cannot claim ignorance.

Alexandria, Virginia, goes one step further by requiring (partial) compliance with the requirements before giving out a transportation management special use permit. The ordinance specifies that the permit runs with the land and is mandatory and binding not only to the applicant or owner, but to all their successors, heirs, or other occupants of the project. (KPMG Peat Marwick, 1989)

MONITORING COMPLIANCE

While effective monitoring is an essential part of any program requiring transportation mitigation measures, it must not exceed the staff or financial capacity of the responsible administration. Thus, the requirements should be easy to monitor, or, if possible, be to some extent self-monitoring.

Montgomery County, Maryland, uses a combination of a self-monitoring and developer-paid audit process before county staff conduct their own review. The developer is required to submit a monthly report on the success of the mitigation program

To ensure that the information provided by these reports is correct, the developer pays a fee, which the county uses to pay an independent auditor. The auditor monitors the project at regular intervals and provides the county with an assessment. Instead of monitoring the implementation of the program on site, which would involve considerable effort, Montgomery County staff simply review both documents. (Hekimian, 1989, 1990)

Alexandria, Virginia, requires the presentation of a transportation demand management strategy before a special use permit is issued. Furthermore, it requires that an annual per unit fee of \$60 be paid into a citywide fund. The TC on the project uses this money for transit subsidies. If the money is not spent, it can be reprogrammed if the city approves the new use. Otherwise, the city can use the money to promote transit. Thus, city staff are involved in the monitoring process only if necessary. It is in the developer's interest to run the program to get a full return on his investment. (Grossman, 1990; KPMG Peat Marwick, 1989)

ENFORCEMENT OF COMPLIANCE

Apart from a feasible monitoring process, a functional enforcement process is necessary. As stated earlier, insufficient monitoring of the implementation of transportation mitigation requirements makes enforcement of the provisions of the agreement difficult or impossible. In addition, penalties for noncompliance, such as withdrawing use and occupancy permits, levying fines, or injunctions through court, while existent on paper, may be difficult to impose because of time and expense. However, even if the jurisdiction has trouble enforcing compliance with requirements on existing projects, a functioning monitoring process is useful if it establishes the permit process for future developments. Once the developer knows that future projects may run into trouble, compliance with requirements on existing projects should become normal procedure. The case of the project with the sidewalk requirement, mentioned above, illustrates that effect.

Failure to make a good faith effort to comply with requirements on residential developments can result in fines in Concord and Contra Costa, California; and North Brunswick, New Jersey. (KPMG Peat Marwick, 1989) However, when this paper was written, none of these jurisdictions had fined a developer. In Alexandria, Virginia, failure to comply with requirements may result in revocation of the transportation management special use permit, although this also had not yet happened. (Grossman, 1990)

Montgomery County, Maryland, has a unique method of enforcing requirements on developments. Developers are required to reach their performance goals before they receive a building or occupancy permit. The permit can be withheld until the performance goal has been reached. After occupancy, a performance bond is used to maintain the performance of the program if the developers' own efforts prove inadequate. (Hekimian, 1989, 1990)

ADEQUACY OF THE REQUIREMENTS

Transportation mitigation measures are useful only if they are appropriate for the project. To ensure this, experience from similar projects should be considered. Montgomery County, Maryland, involves the developer in drafting requirements and is thus able to tailor the requirements to each project. While the developer is allowed to choose the mitigation measures to reduce traffic impacts, the jurisdiction sets strict traffic reduction goals.

Information on commute behavior and attitudes is essential to make mitigation measures as efficient as possible. Residents should be surveyed at regular intervals. North Brunswick, New Jersey, requires that each new tenant or condominium owner fill out a work place/commuter survey. This is used for carpool and vanpool coordination and to determine where a shuttle service might be feasible. (Kish, 1990)

One option for dealing with the conflict engendered by the necessity to develop a clear, equitable, and functional set of TDM measures for each development would be to

require all developers to pay an annual fee based on development size into a transportation fund. This fee could apply not only to "hardware" such as park and ride lots, but also to the "software," i.e., the actual program. This method would be an extension of the approach Alexandria has taken. Developers could decide either to spend the money through approved transportation demand management strategies of their own or to let a regional transit authority integrate their projects into a bigger program.

OTHER FACTORS INFLUENCING THE EFFECTIVENESS OF TDM PROGRAMS

Apart from the processes of establishing, monitoring, and implementing transportation mitigation requirements on residential developments, several other factors influence the success of these measures. While each factor by itself may not determine the success or failure of a TDM program, they are important components influencing the decision process of commuters and should thus not be ignored. They range from the proximity and convenience of transit service to the length and destination of the commute, transportation demand management at the work site, site design at both the residential project and the work site, and zoning and land use policies.

PROXIMITY AND CONVENIENCE OF TRANSIT SERVICE

With the exception of the three new developments within the city of Seattle, all projects evaluated in this study were located in suburban areas. Generally, in suburban areas transit service is less frequent, and the closest bus stop or park and ride lot are often not accessible by foot. According to members of the focus group meeting at Remington, good access to a park and ride lot is an important factor in mode choice. Furthermore, the access to the park and ride lot is often the most congested part of the commute and thus takes an inappropriate amount of time. The longer the access distance or travel time to transit, car- or vanpool in relation to the total commute, the less people will be likely to use alternative modes of transportation.

In addition, suburban work sites may not be linked to the public transportation system. Thus, the tenants of residential developments with a good TDM program may not be able to use public transportation to commute even if they are willing to do so simply because their work sites are not transit accessible. A study conducted in 1989 by the Center for Urban Transportation Research (CUTR) of the University of Florida showed in its national sample that 22 percent of the people with access to public transit at

their residence did not have transit access at their work sites. For work sites in the suburbs, which are the destination of many commuters originating in the suburbs, this percentage is probably even higher.

DESTINATION AND LENGTH OF COMMUTE TRIPS

In previous decades the majority of professional jobs have been located in urban centers. However, in the 1980s, jobs shifted towards suburban areas. In 1980, 57 percent of all office space in the U.S. was located in urban centers and 43 percent in suburbia. In 1986, the reverse was true; 60 percent of all office jobs were in the suburbs, and 40 percent in the cities. (Pisarski, 1987; Office Network, 1987) Between 1960 and 1980, suburb to suburb commutes in metropolitan areas with a population larger than 250,000 increased from 30 percent to almost 42 percent. (Fulton, 1986) The national survey conducted by CUTR indicated that one effect of the "suburbanization of the work place" is that people tend to live closer to their jobs. (CUTR, 1989)

While precise local figures were not available, a similar trend was clearly recognizable in the Puget Sound region. The surveys conducted at The Park at Forbes Creek and at Ballinger Commons, both multi-family rental projects, showed that the majority of respondents worked in a suburban environment, often fairly near where they lived. The survey conducted at The Park showed that only 15 percent of the respondents worked within the central business district of the city of Seattle. (Metro, 1989b) At Ballinger Commons, 23 percent of all respondents worked in downtown Seattle. (Metro, 1989a) According to one manager of another multi-family rental project, most of her tenants worked nearby as well. The recent study conducted by CUTR found that average national commute distances (with the exception of city to city trips) and times between suburbs are shorter than those for any other commute. (CUTR, 1989)

In the Puget Sound area, an increasing number of multi-family rental projects receive building permits in suburban areas. The remark of the manager that most of her

tenants worked nearby indicates that people who rent rather than buy are more likely to live closer to their work site — if they can afford it — than people who own or buy houses. A regional telephone survey conducted by Metro in north King County showed that mean commute time by different types of dwellings were not significantly different. However, the cumulative percentages showed that 27.4 percent of the people who lived in multi-family developments in North King County and drove to work alone had car commute times of ten minutes or less, while this was true for only 20.9 percent of the respondents who lived in single family homes and drove to work alone, a 6.5 percent difference. (Gilmore Research Group, 1989) This finding implies that a portion of suburban renters live at a distance from their work site because they can not afford to live nearby.

TRANSPORTATION DEMAND AND PARKING MANAGEMENT AT THE WORK SITE

The success of efforts to manage transportation demand at the residential end is also affected by the existence of TDM programs and parking management strategies at the work-end. If the majority of the work sites of tenants or residents of new residential developments already have substantial programs, implementation of a program at the home-end may have little effect. On the other hand, certain changes at the work site, such as the removal of free parking, can have a positive impact on TDM programs both at the commercial and residential ends. According to several studies published recently, parking management is one of the most, if not the most, important decision factor in mode choice. (see e. g. Cervero, 1988; CUTR, 1989; Kenyon, 1984; Surber et al., 1984)

SIZE, DESIGN AND LAYOUT FACTORS

Residential site

Recently, an increasing number of transportation scholars have pointed out the importance of factors such as size, layout, and design of a project to the level of transit

use. Only above a certain number of riders and a certain density is public transit feasible. A cul-de-sac arrangement, favored for both multi- and single-family developments, discourages not only through-traffic but also transit access by forcing buses to retrace their routes. While most residential developments have a system of sidewalks, they are often self-contained to discourage trespassing. At the same time, however, that arrangement makes it more difficult for residents to gain access to facilities outside the development and creates prohibitively long walking distances. The emphasis on automobile access has led to a layout that gives preference to car use (especially convenient parking and car access), rather than to a truly pedestrian-friendly environment.

Work site

In addition to factors related to the residential project, factors related to the work site influence the commute decisions of residents. Robert Cervero found that most suburban office projects were insensitive to the needs of pedestrians, cyclists, and transit users. Site layouts segregating buildings and land parcels in many instances create environments hostile to pedestrians. Similar to the layout of residential developments, wide setbacks and separate access roads on commercial developments discourage the entry of transit vehicles on these developments. Cervero concluded: "Where foot travel and transit travel are relegated to a second-class status, not surprisingly, solo-commuting predominates." (Cervero, 1988, p.V) Thus, a good TDM program on the residential side can be rendered worthless if the appropriate measures are not taken at the work site as well.

LAND USE AND ZONING POLICIES

Cervero found that the low density, single-use, and non-integrated character of many suburban office or commercial centers leads to a dependency on the car. In campus-like office parks, the trademark of many high-tech companies in the Puget Sound

area as well as elsewhere in the country, employees need their car to run midday errands, go out for lunch, or travel to the bank. He asserted that on-site or near-site retail services such as shops and restaurants, as well as banks and day-care facilities, are important to lure suburban workers out of their cars. To support this, mixed-use environments were found to have the highest percentage of car- and vanpool arrangements and transit ridership. (Cervero, 1988) While his study was based on suburban economic centers only and did not include the impacts of traffic mitigation measures on the residential end, it is evident that the success of home-end TDM programs is strongly influenced by the situation at the work-end.

Furthermore, authors such as Cervero, Bhatt and Higgins, and others have pointed out the importance of density requirements for residential developments and the necessity to move toward mixed-use zoning policies that allow higher density residential, commercial, and office development to take place near one another as well as near a transit system. A new design concept for suburbia, the "pedestrian pocket", recognizes this need and places all elements within a quarter-mile walking distance to each other. (Kelbaugh, ed., 1989)

RECOMMENDATIONS AND CONCLUSION

RECOMMENDATIONS

This section provides four approaches to designing TDM ordinances for residential developments that mitigate the implementation problems presented above. Both a study on existing TDM ordinances, including requirements from residential developments in other parts of the country (KPMG Peat Marwick, 1989), as well as information from personal communication with staff from these jurisdictions, are included here. However, the following recommendations do not guarantee the success of TDM measures at the home-end; rather, they are designed to give them a chance of success — if the issues concerning zoning, land use policies and other factors are also considered.

The first step for each jurisdiction considering TDM requirements on residential developments should be to decide what it wants to achieve with that policy. It needs to ensure that the policy is consistent with the overall transportation goals for the jurisdiction and the region, and with the land use and zoning laws. Once it has decided to implement TDM measures on residential developments, it must make the commitment to follow through. In addition, the jurisdiction needs to ensure that the costs of the TDM strategies for the developer are scaled to their potential impact. The local jurisdiction should be able to afford the administrative costs to monitor compliance with the requirements and to enforce them. The next step is to balance all of the above against the political climate in which the jurisdiction operates and to decide on a policy. The research for this report has illustrated the results when jurisdictions have not considered these steps carefully enough. Four different approaches to a TDM ordinance for residential developments appear possible after consideration of these issues.

1. **The first approach** is to develop an ordinance requiring minimum size thresholds for increasing sets of requirements. The bigger the project is, the larger is the

number of requirements and the higher the costs. The developer is not required to meet any performance goals apart from the implementation of the measures themselves. This approach is appropriate for jurisdictions where transportation problems are heavy enough to warrant action, but not heavy enough to demand more stringent requirements. It is also most appropriate for small projects and is used for commercial developments by many jurisdictions in the country. It ensures predictability and continuity and is fairly easy to monitor. Since the requirements are clearly stated for each size of development, the information on them cannot get lost. However, this approach cannot ensure that the requirements are adequate for that particular project, and enforcement may prove difficult if the requirement is not appropriate.

2. To avoid inadequate TDM measures for a residential development, the jurisdiction may, in a **second approach**, decide to put the choice of the TDM program measures into the hands of the developer. While a basic set of measures should be carried out for each project, the developer must then choose further measures from a list of additional requirements in order to tailor the TDM program as closely to the development as possible. This second approach is particularly appropriate for larger developments. The jurisdiction reviews the TDM program, approves it if it is considered appropriate for the project, and issues a transportation special use permit. The permit is tied to the land; therefore, the information on the requirements cannot get lost. It can be revoked if the jurisdiction finds that the development's TDM requirements are not carried out adequately.

3. The **third approach** is a variation to the second approach. Its implementation is dependent on the severity of transportation problems in the area and the political feasibility of even stronger requirements. The jurisdiction sets performance goals and leaves the choice of TDM measures up to the developer. In this case, the jurisdiction monitors the performance of the TDM program to determine whether the developer

reaches its goals. The jurisdiction revokes the transportation special use permit if the developer does not make a good faith effort to reach these goals.

4. A **fourth approach**, even more stringent than the above, is to require the developer to mitigate the projected traffic impact of the development before it has been built. The developer must do this by devising and implementing a TDM program on an already existing project. The developer does not receive a building permit before the performance goal for the TDM measures has been reached. This approach requires a high degree of commitment from the jurisdiction and is politically feasible only if the transportation system in the jurisdiction or region cannot be eroded any further. To simplify the monitoring process for the jurisdiction, each TDM program's process has to be reported to the jurisdiction on a regular basis. To ensure the correctness of these reports, a process that requires the developer to pay for an independent audit mechanism, in addition to the self-monitoring processes, used in Montgomery County, Maryland, is an appropriate solution.

To ensure compliance under all approaches, the jurisdiction may decide to require the developer, manager, or owner to pay an annual fee for each unit into a fund or performance bond. The developer can then use the fund to comply with the requirements, e.g., buy bus passes. Should the jurisdiction determine that compliance is inadequate, it can use the funds to finance TDM programs. If the developer is found to have made a good faith effort, he or she may be allowed to incorporate the remaining funds into the next year's program. The policy may also allow the developers to organize themselves into Transportation Management Associations in coordination with commercial areas in order to pool resources and efforts.

CONCLUSION

The quantitative evaluation of TDM requirements on residential projects in suburban Puget Sound proved difficult, since only a small number of projects had

implemented these measures. However, the analysis of available quantitative and qualitative information pointed out implementation problems related to

- the decision process leading to the imposition of mitigation requirements,
- institutional memory of requirements,
- monitoring of compliance,
- enforcement of compliance, and
- adequacy of mitigation requirements.

The research presented above shows the dilemma many jurisdictions face. The case-by-case approach to transportation demand management on residential projects used by unincorporated King County, Kirkland, and Redmond leaves both the staff of the jurisdictions, as well as the developer, with too many uncertainties about their respective responsibilities and creates equity problems. It does not send a strong enough signal of commitment on the part of the jurisdictions and allows developers to ignore or overlook their responsibilities. On the other hand, the evaluation of existing projects with implemented TDM measures has proved the importance of tailoring requirements to a particular development, as well as its surroundings.

Transportation demand management at residential projects, like any other policy, needs clearly defined and measurable goals and commitment by the local jurisdiction. It has to be integrated in a wider framework of local and regional transportation planning, to be balanced with the land use and zoning policies of the jurisdiction and the region, and to account for the financial and personnel capacity of the jurisdiction. A stringent and well considered TDM ordinance for residential developments is worthless if it cannot be monitored and enforced, if it is not linked to land use and zoning policies, or if the political climate does not allow for the level of commitment on the part of the jurisdiction necessary to make the envisioned residential TDM policy feasible. Thus, it is necessary to decide between the need for clear thresholds, a well structured ordinance, and the particular requirements of the project, while keeping the tradeoffs among them in mind.

The success of development, imposition, monitoring, and enforcement of TDM measures on residential developments is not only dependent on the quality of the implementation of these strategies but also on other factors such land use and zoning policies. However, jurisdictions have a number of options for implementing TDM ordinances for residential projects to mitigate implementation problems.

REFERENCES

- Bhatt, Kiran and Higgins, Thomas, "An Assessment of Travel Demand Approaches at Suburban Activity Centers," K.T. Analytics, Inc., USDOT, Office of Technical Assistance and Safety, UMTA, Washington, DC, July 1989.
- Cervero, Robert, *America's Suburban Centers — A Study of the Land Use Transportation Link*, Final Report to UMTA, DOT-T-88-14, January 1988.
- CUTR, "Factors related to Transit Use," Center for Urban Transportation Research, College of Engineering, University of South Florida, Tampa, October 1989.
- Fulton, Philip, "Changing Journey-to-Work Patterns: The Increasing Prevalence of Commuting Within Suburbs in Metropolitan Areas," Paper presented at the 65th Annual Meeting of the Transportation Research Board, Washington, D.C., 1986.
- Gilmore Research Group, "1989 North King County and Urban Snohomish County Transportation Market Segmentation Study, vol. I and II", Municipality of Metropolitan Seattle, August 1989.
- Grossman, Larry, transportation planner, city of North Brunswick, personal communication, June 11, 1990.
- Hekimian, Alexander, "Traffic Mitigation Measures in Montgomery County, Maryland," Transportation Planning Division, Maryland-National Capital Park & Planning Commission, Silver Spring, Maryland, September, 1989.
- Hekimian, Alexander, transportation planner, Montgomery County, June 20, 1990.
- Hendriksen, Barbara, real estate agent, personal communication, July 7, 1990.
- Kelbaugh, Doug, ed., *The Pedestrian Pocket Book — A New Suburban Design Strategy*, Princeton Architectural Press, Princeton and Seattle, 1989.
- Kenyon, Kay, "Increasing Mode Split Through Parking Management: A Suburban Success Story," *Transportation Research Record*, No. 980, 1984.
- King County Draft Administrative Guidelines for Application of TSM under SEPA, April 18, 1990
- Kish, Mike, city planner, personal communication, North Brunswick, June 18, 1990.
- KPMG Peat Marwick, "Status of Traffic Mitigation Ordinances," part 1 & 2, KPMG Peat Marwick, R L Oram Associates, UMTA, Vienna, VA, August 1989.
- Metro, Ballinger Commons Survey, October 1989^a.
- Metro, The Park at Forbes Creek Survey, June & August 1989^b.
- Metro, "Transportation Demand Management Guidelines," April 1989^c.

Office Network. 1987, "National Office Market Report," Houston, Texas, 1987.

Pisarski, Alan, *Commuting in America*, Eno Foundation for Transportation, Inc., Westport, Connecticut, 1987.

Surber, Monica, et al., "The Effects of Ending Employer Paid-Parking for Solo Drivers," University of California, Los Angeles, 1984.

APPENDIX A
INTERVIEW GUIDES

1. INTERVIEW GUIDE FOR DEVELOPERS ON HOME-END TRANSPORTATION DEMAND MANAGEMENT STRATEGIES

1. Information on the project

1.1. Rent range/price per unit.

1.2. Is this project targeted towards a specific clientele? (e.g.):

- Singles/married couples, with kids?
- Age group
- Socio-economic group/income range
- Other

1.3. Occupancy rate

1.4. Turnover

1.5. Parking ratio

1.5.1. How many stalls per GSF? At the legal ratio? Is that enough?

1.5.2. Are there any tenants without cars? How many?

1.6. Nature of sidewalks

1.6.1. Is there a complete system throughout the entire development? (Do people have to use parking lots or roadways in some parts?)

1.6.2. Is continuous walking access to transit provided? If the project has a wall or a fence around it, are there breaks to ensure easy access to transit facilities outside?

1.7. Transportation Coordinator

1.7.1. Is there a transportation coordinator on the project? (name, phone #)

1.7.2. How much time does he spend on his task? What is his salary?

1.8. Does the project have a communal area or an on-site office where information can be provided and shared? Is it used?

1.9. Is there a tenant organization on the project?

2. TDM program requirements on the project

2.1. Which of the required measures were you able to implement to date?

2.2. How long did it take you to implement them?

2.3. Did you have any implementation problems? If yes, what were they for each requirement?

2.4. Costs

2.4.1. What are the construction costs for the entire development?

2.4.2. Which portion of these costs were required to fulfill TDM program requirements? (actual or estimated \$)

2.5. Are you in the process of implementing any of the remaining required measures at this time? (If so, which ones?)

2.6. Why were you not able to implement them to date? Were there any particular problems?

2.7. Do you expect to be able to implement them? When?

2.8. Are there any required measures for this project you will not be able to implement? Why is it not possible?

2.9. Is the jurisdiction enforcing the requirements or do you have leeway?

2.10 Has that influenced compliance with the requirements?

2.11. Did you know whom to contact at Metro to establish a CIC, provide bus passes, etc.?

2.12. Were there any problems with the contact at Metro or with Metro procedures?

3. Experience with the TDM program on the project

3.1 How did the tenants/buyers of the project react to the offer(s)?

3.2. Did you receive any comments from their side? Which?

3.3. Do they use the offered shuttle, bus pass, etc.?

3.4. What is your estimate of the percentage, real #s of tenants taking advantage of the offer(s)? (Are there any records?)

3.5. Which one(s) was/were most appreciated?

3.6. Which, in your opinion, works best? What led you to that conclusion?

4. Overall experience with TDM program requirements

4.1. Comparison with other TDM program projects

4.1.1. Do you have any other TDM program projects? (Record them)

4.1.2. Did you perceive any differences between the projects in terms of

- . Offer acceptance by tenants**
- . Difficulty of implementation (reasons?)**
- . Costs of implementation, or**
- . Multi- versus single family projects?**

**4.2. Do you have any suggestions for changes in the wording of the requirements?
Where are they unclear or not specific enough?**

4.3. Threshold for TDM program requirements

4.3.1. In your opinion, where should the threshold for requiring a home-end TDM program be? Why? (Size, cost of development, which portion of the project's costs should be spent on TDM program measures?)

4.3.2. What is, in your opinion, the appropriate development size for requirement of each of the following requirements:

- . Transit information**
- . Carpool information**
- . Bike shed**
- . Free bus pass (one-time)**
- . Project assisted access to carpool facilities and rideshare information**
- . Shuttle to nearest park and ride lot**
- . Carpool coordination on the project**
- . Bus pad**

4.4. Did you offer any of the measures on your own in other developments without being subject to them through a TDM program? If yes, what was your rationale?

4.5. Have you advertised with these services for any of your developments? Did you use it as a marketing tool?

4.6. Did you get any reaction from your prospective clientele?

4.7 Is there any indication that some clients favor projects which provide these services?

4.8. Is proximity to transit service a factor in your site selection process?

2. INTERVIEW GUIDE FOR TRANSPORTATION COORDINATORS ON HOME-END TRANSPORTATION DEMAND MANAGEMENT STRATEGIES

1. Information on the project

1.1. Rent range/price per unit.

1.2. Is this project targeted towards a specific clientele? (e.g.:)

- . Singles/married couples, with kids?
- . Age group
- . Socio-economic group/income range
- . Other

1.3 Occupancy rate

1.4 Turnover

1.5 Parking ratio

1.5.1. How many stalls per GSF? At the legal ratio? Is that enough?

1.5.2. Are there any tenants without cars? How many?

1.6. Does the project have a communal area or an on-site office where information can be provided and shared? Is it used?

1.7. Is there a tenant organization on the project?

2. The work of the transportation coordinator

- 2.1. How much time do you spend with transportation issues like giving out bus-passes or providing info? (How much does it cost your employer?)
- 2.2. Do your tenants use the offered bus-passes, the CIC, other sources of transit-info that you provide?
- 2.3. What is your estimate of the percentage, real #s of tenants taking advantage of the offer(s)? (Ask if records exist.)
- 2.4. Did you receive any comments from their side? Which?
- 2.5. Which one(s) was/were most appreciated? What led you to that conclusion?
- 2.6. Which, in your opinion, work best? What led you to that conclusion?
- 2.7. Is there one that is not implemented right now that you think might work?
- 2.8. How many tenants take the bus every morning who are not eligible for the bus-pass any more? (Ask if there is a convenient bus-connection - whether it makes sense at all to ask that question!)
- 2.9. Are there any carpools originating from this development that you are aware of? Where do they go?
- 2.10 What do you think could persuade more of your tenants to take the bus, carpool?

2.11. How is your contact with Metro? Is it cooperative or do you have any problems?

2.12. Is there anything in your relationship with Metro that you think should change?

2.13. What do think about the idea to have a contractor run a shuttle, assist carpool matching etc. that would serve this project and others in the neighborhood?

3. Home-End Transportation Demand Management Programs Residential Focus Group Questions

I. General questions

How do you feel about the traffic situation?

- In the region,
- during your commute,
- in your neighborhood?

(What, in your perception, is the biggest problem?

How do you think it could be solved?)

Do your employers provide incentives to carpool, take the bus, etc.? Do you have free parking at your work place?

What are your experiences with it? Does it work, not work -why not?

(If there are no provisions, would you like to have them introduced?)

II. Own commute behavior

What made you decide to move here?

Do you carpool, ride the bus - sometimes, on a regular basis - now?

What motivated you to start that?

What would be the problems you would run into if you were to carpool, take the bus now?

What would influence your decision to start doing that now?

Did you get a/like the package with information on transportation options when you moved here?

Was the information adequate?

How helpful was the transportation coordinator in that respect? What other info/help would you like him/her to provide?

Some of you have been offered a free bus pass when you moved in. Did you use it? Why not?

Would you find it more useful to get two free ride passes as part of your info package from Metro?

Would you feel differently if you had the chance to catch a shuttle to the next PARK AND RIDE lot right here on the development? Why not?

III. Changes in Policy Affecting Mode Change

Rent for parking lot at the at the residential end:

With the growth of the region housing has become very expensive. One of the reasons for that development is the increase in the price of land. Here on the project, much of the space is taken up by parking lots. At the moment, the parking to apartment ratio in most residential developments is about two to one. If developers were able to reduce that ratio, they would be able to reduce costs. In many European cities, and even in some areas of the city of Seattle, people pay the rent for their parking spot separately from the rent for their apartment. **How would you feel about being charged separately for parking?** Let's say if you have two cars, you would pay the same amount as you pay now. If you have only one car, you would pay less, and if you use three parking spots because you maybe have an RV, you would pay more. This would be more equitable, because the people with less cars would not subsidize the people with more cars. It would reduce the costs of housing for people with a relatively lower income who tend to have fewer cars. What do you think about this idea?

Do you think this could work? Why not?

Would you feel differently if you had the chance to catch a shuttle to the next park and ride lot right here on the development? Why not?

Fees for parking at the work place:

A few weeks ago the legislature passed a new gas tax. It included a provision that enables municipalities to tax commercial parking lots. On the long run, and this is really a long shot, this could end free parking at your work place. How would you react to that? Under which circumstances would you be in favor of such a measure?

In general, what do you think has to change to make other means of transportation like carpooling, the bus, or rail more attractive? What would you advise policy makers to do?

IV. Design and zoning changes

Some planners are thinking about changes in the design of developments like this one to make it friendlier for pedestrians. How would you feel about that idea?

Some are even thinking about changes in the zoning requirements, i.e. a shift to mixed use to make it easier for people to leave their cars on the parking lot. One of the names the media has used for that approach is the "compact village". Examples here in the area would be Ballard, Fremont, Wallingford, and maybe Aurora. Would you like to live in a neighborhood where you can do part of your shopping by foot or to walk or bike to work?

What are the things you would be concerned about before you would move into such an area?